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ially his own field, and is in fact a development of the past six years. It is a distinctive contribution of the British school of aerographers. We may explain that the balance between pressure and velocity of air flow, or what is known as the strophic balance, leads to an equation for the gradient wind of the following form:

$$s = 2\omega v p \sin \phi \pm v^2 p \cot r/E$$

The first term in the right-hand member of the equation represents velocity due entirely to the earth's rotation and hence is known as the geostrophic wind. The other is known as cyclostrophic. Only a few months ago J. S. Dines called attention to a rather remarkable outcome of this equation, where in the case of a path concave to the "low," velocities of the order of 6m/s for normal counter-clockwise rotation, and 46m/s for rotation in the opposite direction, appear to be possible. Thus a depression revolving with high speed in a *clockwise* direction in the northern hemisphere is dynamically possible. There are reasons why such an eddy on a large scale might not be established or last long, but small area eddies such as those around high buildings, etc., evidently can be set up with rotation either clockwise or anti-clockwise. This raises the question, How often are dust-whirls, tornadoes, and waterspouts observed with a clockwise rotation?

Sir Napier Shaw uses as a frontispiece a chart showing paths of the centers of some notable cyclonic depressions of long duration. One is the path of a *baguio* traced by McAdie from lat. 15° N. in the western Pacific, starting on November 20, 1895, and reaching the Oregon-California coast January 12, 1896, a rather definite duration of 54 days at sea and a probable history of 4 days more in the United States and 5 days over the North Atlantic. Two other long duration storm paths are given.

These paths of long duration are significant in connection with origin, directive force and persistence of structure of cyclones and anti-cyclones. The most pressing question to-day before aerographers is accurate knowledge of

the driving forces of a depression, and the directive resultant. There can be no accurate forecasting without this knowledge.

We are promised three more volumes from the University Press; one, a general survey of the globe and its atmosphere. A second on the physical properties of the atmosphere, and a third, a formal exposition of the dynamics and thermics of the atmosphere.

Sir Napier Shaw is to be congratulated not only on the output from his own industrious pen, but upon what he has accomplished in stimulating the young men around him, Lempfert, Dines, Gold, Cave, Taylor and others.

A. M.

#### THE NATIONAL ACADEMY OF SCIENCES

THE eleventh number of Volume 4 of the *Proceedings of the National Academy of Sciences* contains the following articles:

*The "Homing Habits" of the Pulmonate Mollusk Onchidium*: Leslie B. Arey and W. J. Crozier, Bermuda Biological Station for Research, Dyer Island, Bermuda. *Onchidium floridanum* lives during high tide in "nests," i. e., rock cavities, containing a number of individuals. The individuals leave the nest in low water to feed, and return simultaneously to it before the tide rises again, giving evidence of homing behavior.

*Growth and Duration of Life of Chiton Tuberculatus*: W. J. Crozier, Bermuda Biological Station for Research, Dyer Island, Bermuda. The growth curve is obtained on the assumption that the age of a chiton may be estimated from the growth-lines upon its shell. The mean duration of life is probably a little less than eight years.

*Growth of Chiton Tuberculatus in Different Environments*: W. J. Crozier, Bermuda Biological Station for Research, Dyer Island, Bermuda. Growth curves obtained under different conditions are compared.

*The Interferometry of Vibrating Systems*: C. Barus, Department of Physics, Brown University. The high luminosity of the achromatic interferences and the occurrence of but

two sharp fringes make it possible to utilize them even in cases when the auxiliary mirrors vibrate. The vibration interferometer is quite sensitive, provided the average currents are of the order of several microamperes.

*On the Essence of Physical Relativity:* Sir Joseph Larmor, Cambridge, England. A general discussion of the physics underlying relativity, with particular reference to an article by Leigh Page.

*Gravitational Attraction in Connection with the Rectangular Interferometer:* Carl Barus, Department of Physics, Brown University. The rectangular interferometer is so sensitive in the measurement of small angles that it may be used for the measurement of the Newtonian constant of gravitational attraction.

*The General Character of Specific Heats at High Temperatures:* Walter P. White, Geophysical Laboratory, Carnegie Institution of Washington. The general law covering the behavior of atomic heats from the lowest temperatures up demands that at sufficiently high temperatures all atomic heats at constant volumes should have the value 5.96. A contrary hypothesis has been made, namely, that atomic heats continue to increase with the temperature. The substances here examined give evidence that the atomic heats do increase above the value 5.96.

*On Certain Projective Generalizations of Metric Theorems, and the Curves of Darboux and Segre:* Gabriel M. Green, Department of Mathematics, Harvard University. The continuation of earlier work by the same author in the *Proceedings*.

*The Rectangular Interferometer with Achromatic Displacement Fringes in Connection with the Horizontal Pendulum:* Carl Barus, Department of Physics, Brown University.

THE twelfth number of Volume 4 contains the following articles:

*The Absorption Spectrum of the Novae:* W. S. Adams, Mount Wilson Observatory, Carnegie Institution of Washington. A discussion of Nova Aurigæ of 1892, Nova Persei of 1901, Nova Geminorum of 1912, and Nova Aquilæ of 1918. The displacements of the lines in all

these stars are directly proportional to wavelengths, and divide themselves into two pairs of equal amount. Of these the first pair of stars has exactly twice the displacement of the second. In the case of Nova Aquilæ, there is a progressive increase in the values of the displacements of the absorption lines at successive dates. Various hypothetical explanations are discussed.

*On Jacobi's Extension of the Continental Fraction Algorithm:* D. N. Lehmer, Department of Mathematics, University of California. A closer study of Jacobi's expansion reveals a number of remarkable points. Six theorems are stated.

*A Characterization of Jordan Regions by Properties having no reference to their Boundaries:* Robert L. Moore, Department of Mathematics, University of Pennsylvania. The theorem is proved: In order that a simply connected, limited, two-dimensional domain  $R$  should have a simple closed curve as its boundary it is necessary and sufficient that  $R$  should be uniformly connected im kleinen.

*A Biometric Study of Human Basal Metabolism:* J. Arthur Harris and Francis G. Benedict, Nutrition Laboratory and Station for Experimental Evolution, Carnegie Institution of Washington. An analysis of measurements on 136 men, 103 women, and 94 new-born infants.

*Sex and Sex Intergrades in Cladocera:* Arthur M. Banta, Station for Experimental Evolution, Carnegie Institution of Washington. The presentation of facts in regard to *Cladocera*, with the discussion of their significance with regard to sex intergrades in general, leading to the tentative conclusion that sex is always relative and that while most individuals of whatever species are prevailingly male or prevailingly female, every individual may have something of the other sex intermingled with its prevailing sexual characters.

*On the Method of Progression in Polyclads:* W. J. Crozier, Bermuda Biological Station for Research, Dyer Island, Bermuda. In turbellarians generally, muscular operations analogous to those executed by the foot of chitons

and of gastropods are essentially concerned in creeping locomotion.

*The Phylogeny of the Acorn Barnacles:* Rudolf Ruedemann, State Museum, Albany, N. Y. The derivation of an *Eobalanus* from a *Rhinocaris*-like phyllopod is illustrated in a set of diagrams.

*Possible Derivation of the Lepadid Barnacles from the Phyllopods:* John M. Clarke, State Museum, Albany, N. Y. So far as present knowledge extends, the metamorphoses of the phyllopods into the two great branches of the barnacles were essentially contemporaneous.

*Refractive Index and Solubilities of the Nitrates of Lead Isotopes:* Theodore W. Richards and Walter C. Schumb, Wolcott Gibbs Memorial Laboratory, Harvard University. The difference in atomic weight of the lead (207.20 and 206.41) has no appreciable effect on the refractive index or on the molal solubility of the different samples of lead nitrate.

*The Purification by Sublimation and the Analysis of Gallium Chloride:* Theodore W. Richards, W. M. Craig and J. Sameshima. Wolcott Gibbs Memorial Laboratory, Harvard University. The method rests on the fact that gallium trichloride sublimes and distils at a low temperature, whereas the other chlorides likely to be associated with it are much less volatile.

*The Purification of Gallium by Electrolysis, and the Compressibility and Density of Gallium:* Theodore W. Richards and Sylvester Boyer, Wolcott Gibbs Memorial Laboratory, Harvard University. The method of separating gallium from indium by means of the different solubilities of the hydroxides in caustic alkali was tested without success; much more promising results were obtained by the electrolytic method. The compressibility of solid gallium was found to be  $2.09 \times 10^{-6}$ , and of liquid gallium  $3.97 \times 10^{-6}$ , nearly twice as great, although its volume is less. The density of the liquid was 6.081, and of the solid 5.885.

*The Growth-rate of Samoan Coral Reefs:* Alfred G. Mayor, Department of Marine Biology, Carnegie Institution of Washington. the growth rate of *Acropora*, *Porites*, *Pocillopora*, *Pavona*, *Psammocora* are given; and the

weight of limestone added per year to the upper surface of the Aua reef-flat is estimated as 805,000 lbs. Other similar estimates are given.

*The Distances of Six Planetary Nebulae:* Adriaan van Maanen, Mt. Wilson Solar Observatory, Carnegie Institution of Washington. The nebulae N.G.C. 2392, 6720, 6804, 6905, 7008 and 7662 are examined. The parallaxes range from 0."002 to 0."021, and the diameters from 10,000 to 1,350 astronomical units.

*National Research Council:* Minutes of the Meeting of the Executive Board, July 9, August 13, September 9 and October 8.

We may summarize the articles in Volume 4 of the Proceedings as follows: Mathematics, 9; Astronomy, 11; Physics and Engineering, 25; Chemistry, 5; Geology and Paleontology, including Mineralogy and Petrology, 9; Botany, 3 (see also Genetics); Zoology, including General Biology, 12 (see also Genetics); Genetics, 6; Physiology and Pathology, 10; Anthropology and Psychology, 1; a total of 91 articles.

The division of these articles between members of the Academy and non-members is 39 and 52 respectively.

The list of institutions which have contributed three or more articles is as follows: Carnegie Institution, 15, divided as follows: Solar Observatory, 7, Nutrition Laboratory, 4, Geophysical Laboratory, 1, Marine Biology, 1, Station for Experimental Evolution, 1, Tortugas Laboratory, 1; Harvard University, 15; Brown University, 7; University of Illinois, 5; Bermuda Biological Station for Research, 4; University of California, 4; University of Chicago, 4; University of Pennsylvania, 4.

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### OPPORTUNITIES FOR CONTACT INFECTION<sup>1</sup>

AN outstanding feature of the influenza pandemic is the remarkable infectivity of the disease. There is scarcely a community in

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